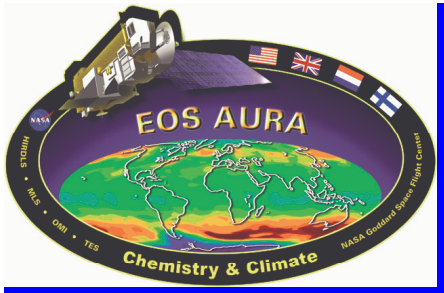


OMI Aerosol Products Preliminary Evaluation

Omar Torres, Marcos Andrade
JCET
University of Maryland Baltimore County

AURA Validation Workshop
9-21-2005
Greenbelt, Maryland

OMI Aerosol Products

Spatial Resolution: 13X24 km

- UV Aerosol Index : Qualitative Indicator of absorbing aerosols

$$AI = 100 \log \left[\frac{(I_{360})_{meas}}{(I_{360}(R_{sfc})_{calc}} \right]$$

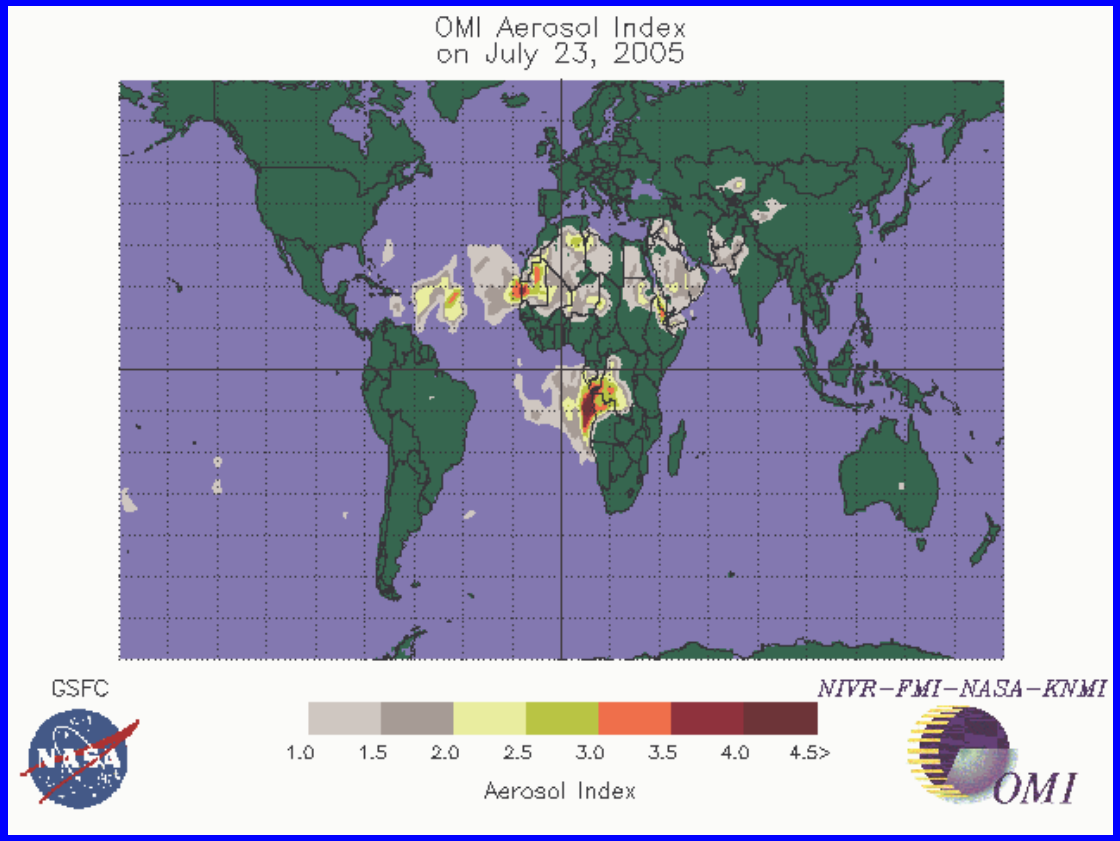
Product Status: Publicly released

Quantitative parameters (388, 500 nm):

-Aerosol Extinction Optical Depth, τ_{ext}
-Aerosol Single Scattering Albedo, ω_0
-Aerosol Absorption Optical Depth, $\tau_{abs} = \tau_{ext}(1-\omega_0)$

Product Status: Provisional release October-2005

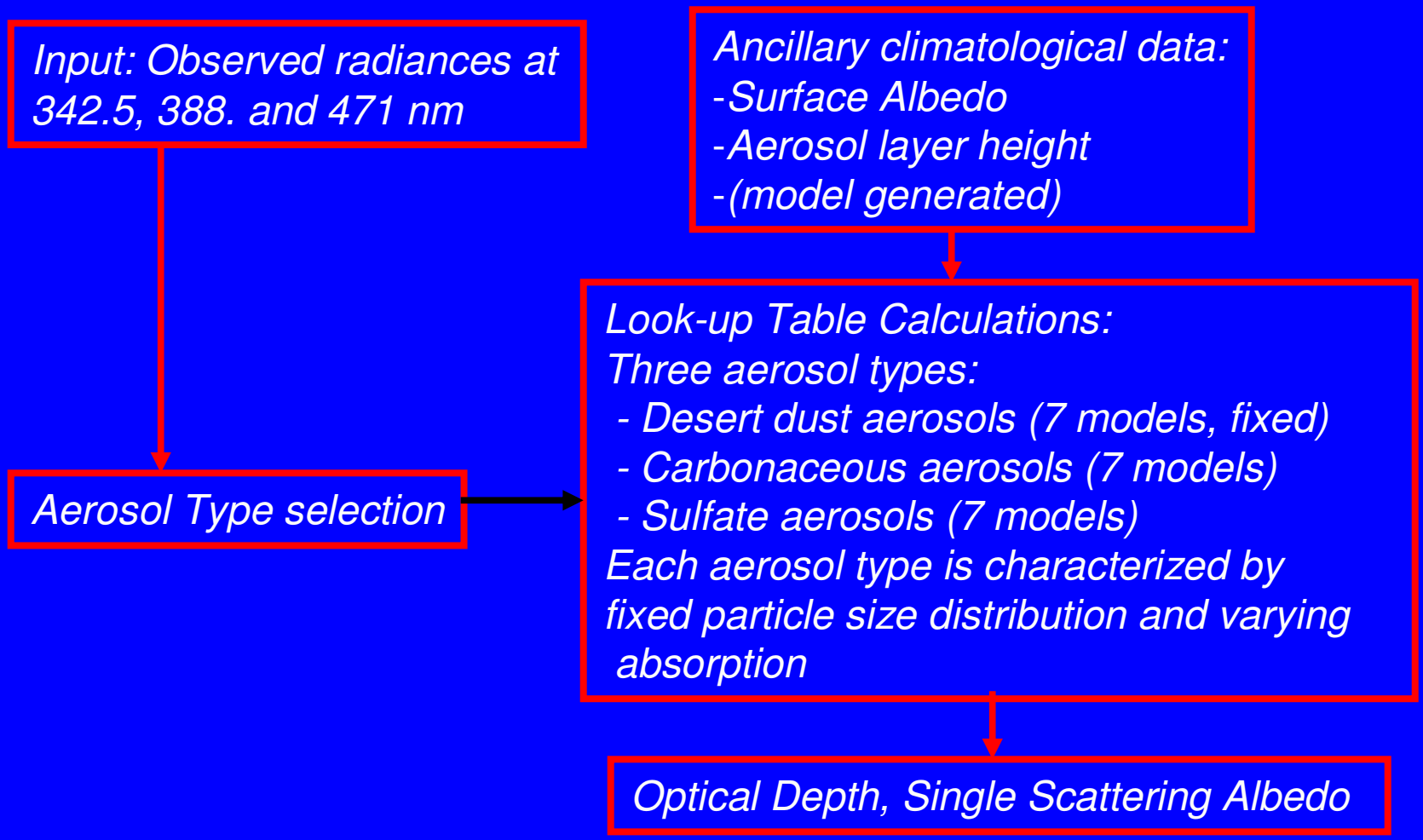
OMI Aerosol Index



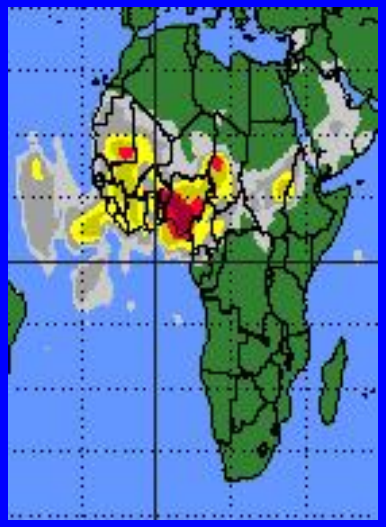
-By-product of Total Ozone Algorithm (OMTO3)
-Uses 331 and 360nm (extends the 20-year TOMS record)
-Sensitive to mineral dust and elevated carbonaceous aerosols
-Detects UV-absorbing aerosols over ice, snow, clouds

Optical Depth and Single Scattering Albedo

Retrieval Procedure

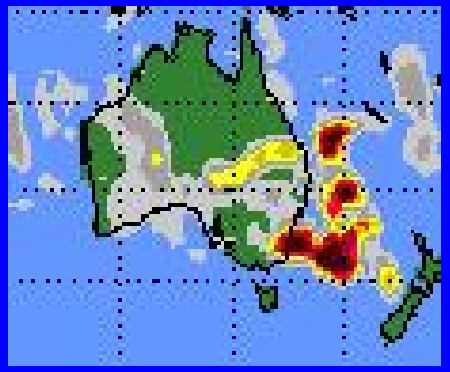


Aerosol Type Selection

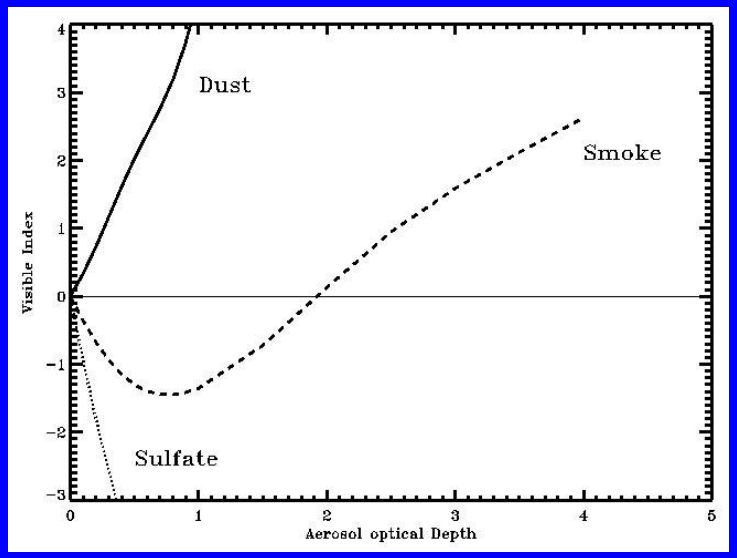


Near UV observations separate absorbing aerosols (smoke, mineral dust, volcanic ash) from other non-absorbing aerosol types.

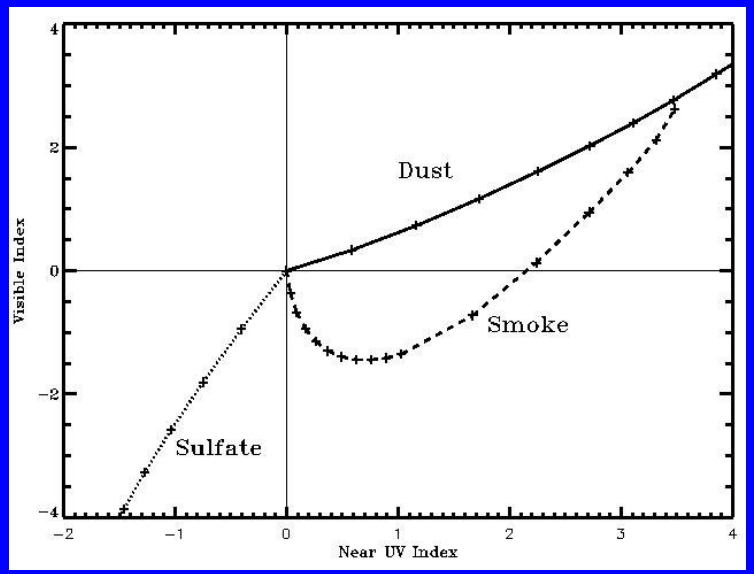
Near UV observations only cannot be used to differentiate between absorbing aerosol types



Combined use of UV and visible observations for aerosol type identification



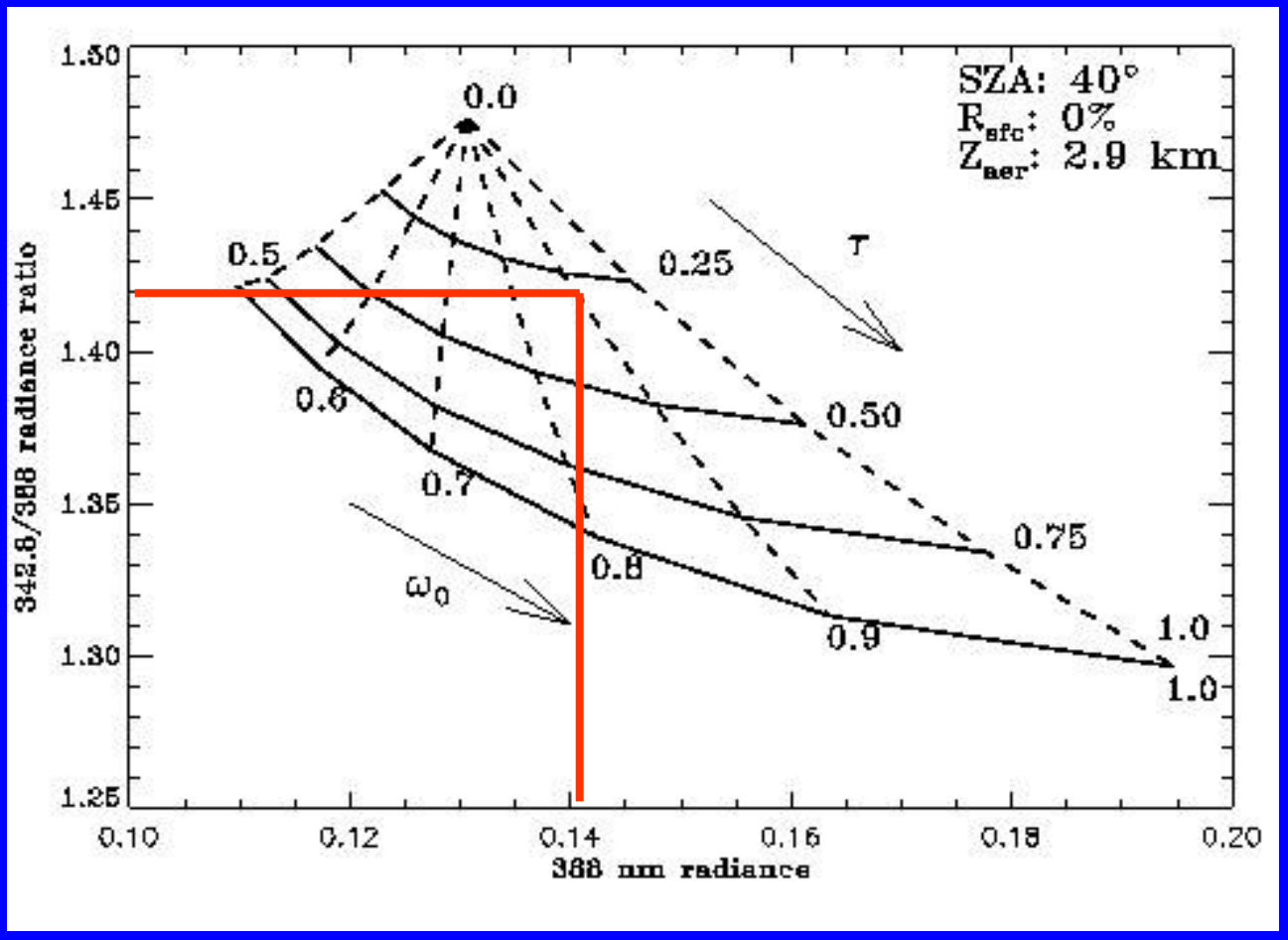
Aerosol optical depth



Near UV Index

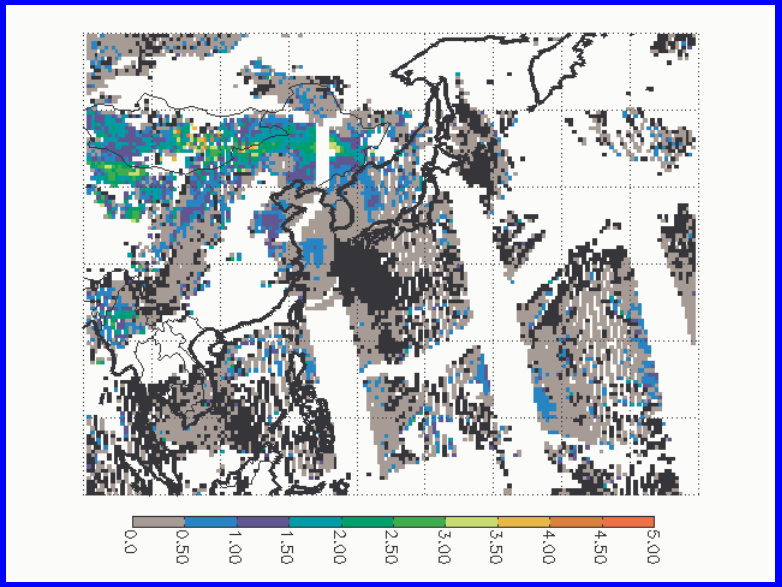
Aerosol optical thickness and single scattering albedo

Retrieval scheme

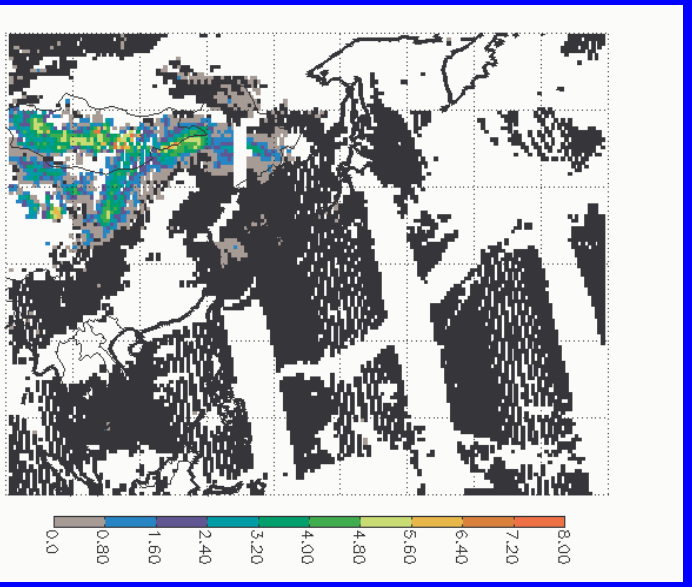


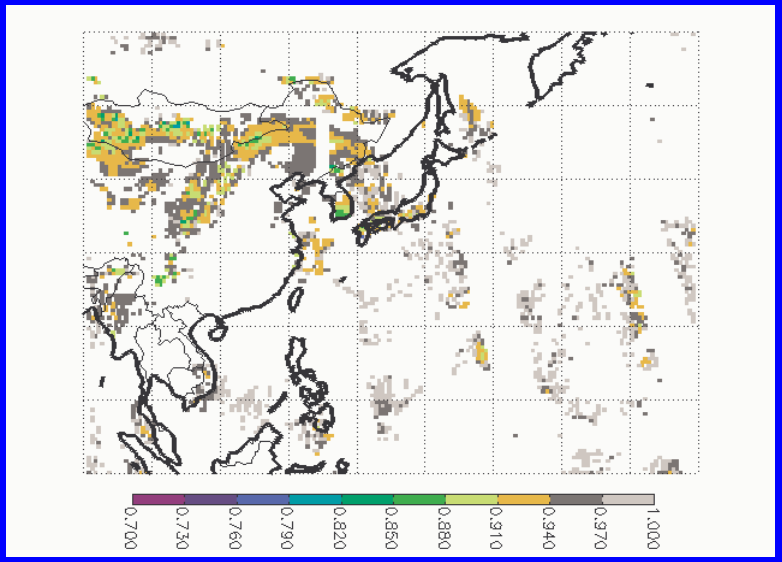
Sample Retrieval, April 5, 2005

Near UV AI

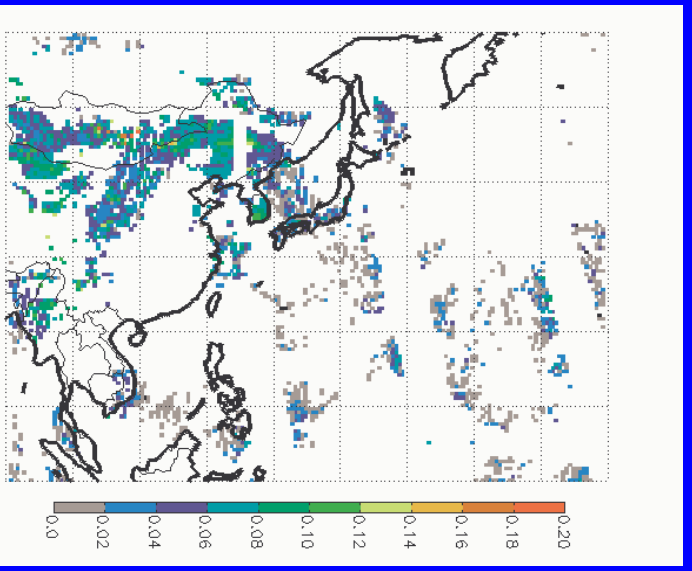


Visible AI



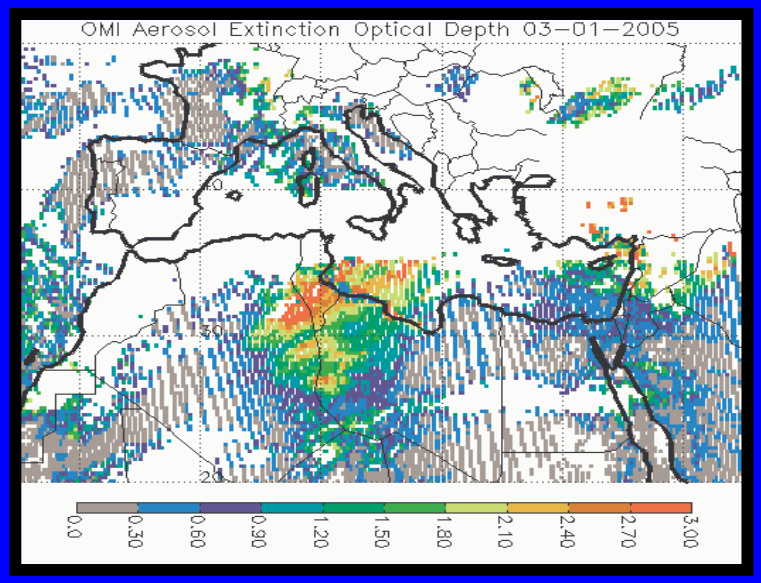


Single Scattering Albedo

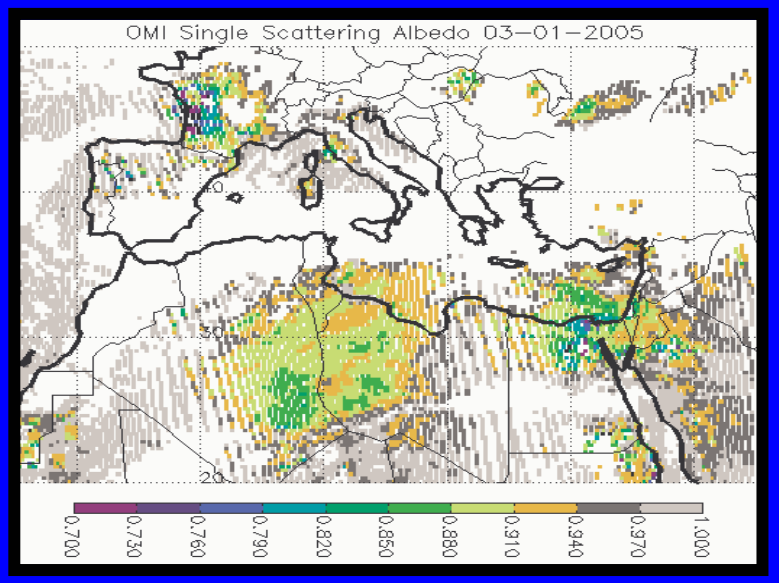


Absorption Optical Depth

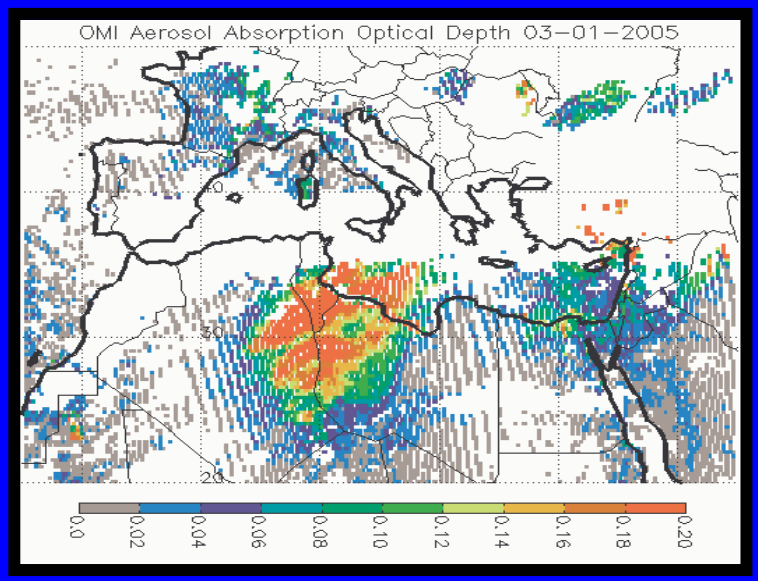
Aerosol Extinction and Absorption Optical Depth



AOD



SSA



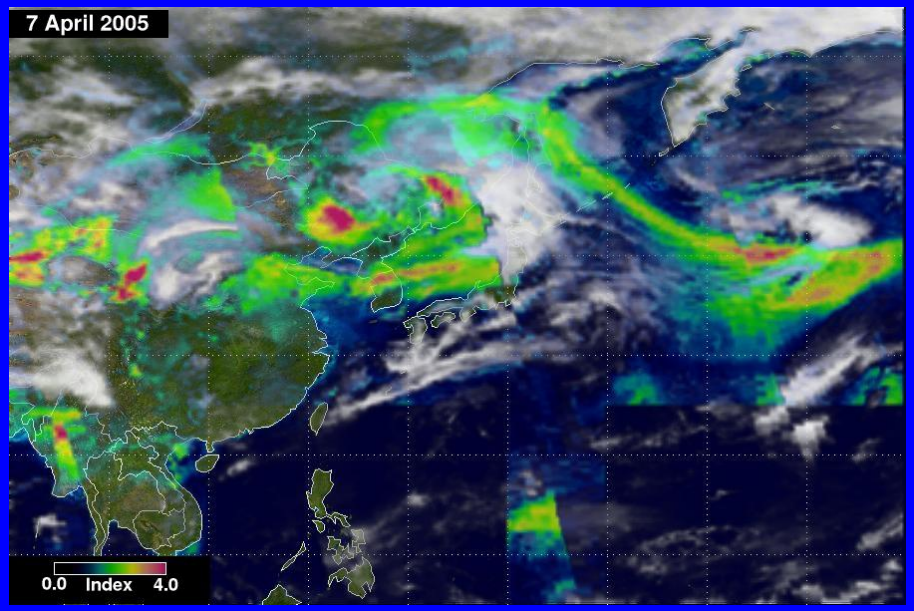
Absorption Optical Depth

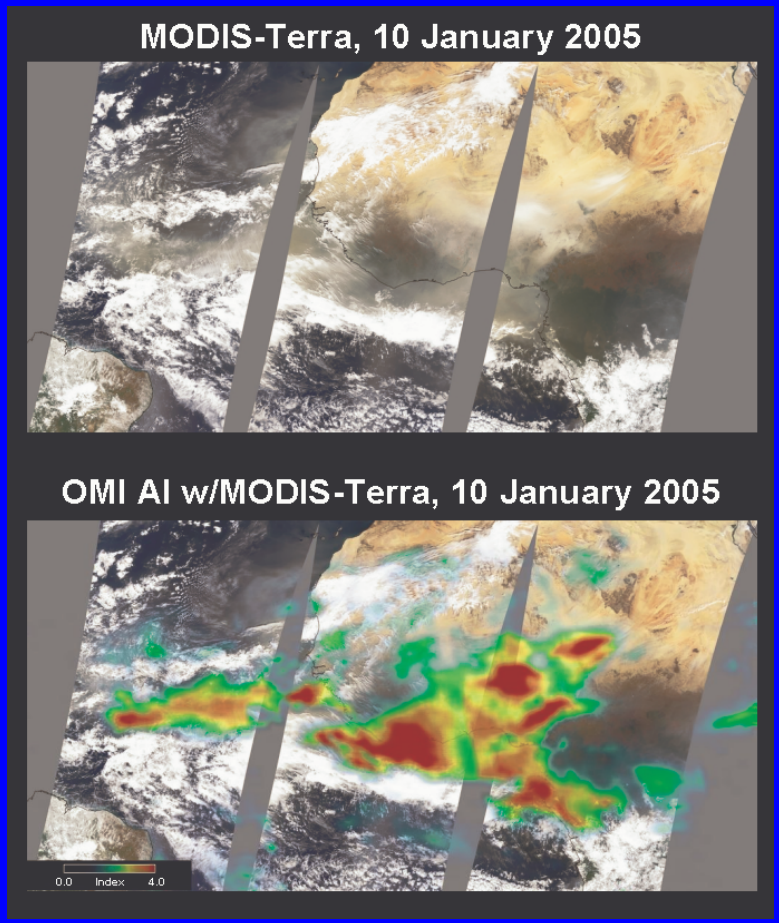
03-01-2005

Validation issues (1)

Aerosol Index:
-Because of its qualitative nature can't be validated
-Observations are needed to understand the AI signal associated with cloud-aerosol interaction
-Is the AI sensitive to aerosols within clouds, below clouds?

Useful measurements:
Airborne lidar, sunphotometer observations
CALIPSO profiles
ACAM type instruments



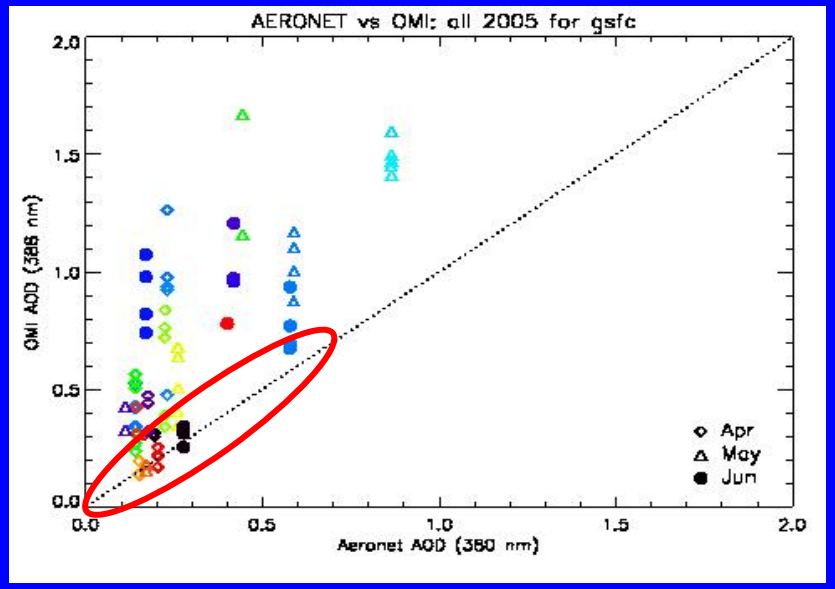


C. Seftor, SSAI

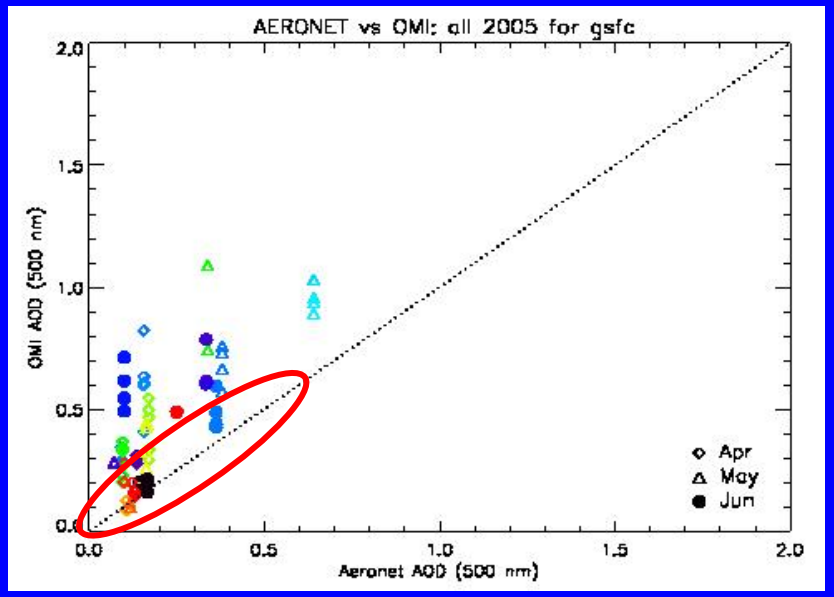
Validation Issues (2): Extinction Optical Depth

OMI-Aeronet Comparison at GSFC site

Collocation criteria:
-OMI Reflectivity less than 10%
-All points within +/- 0.25°
-Ground based obs. within 30 min. of overpass



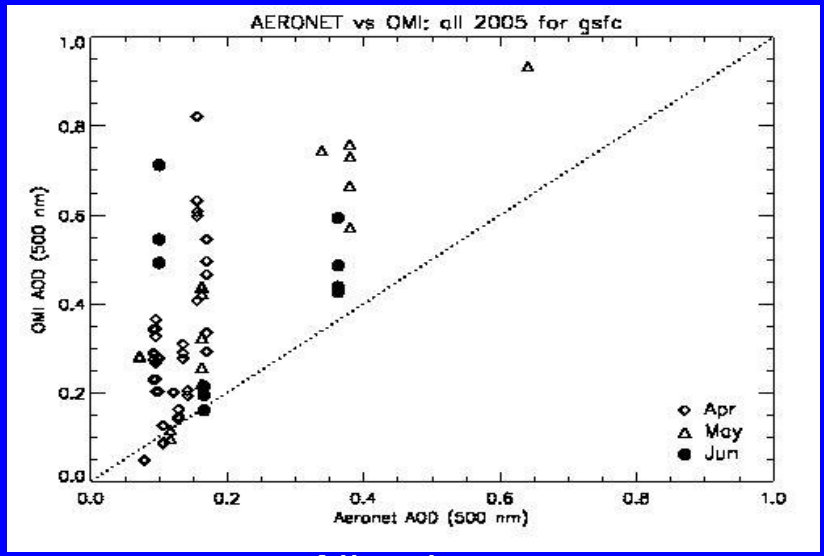
380 nm



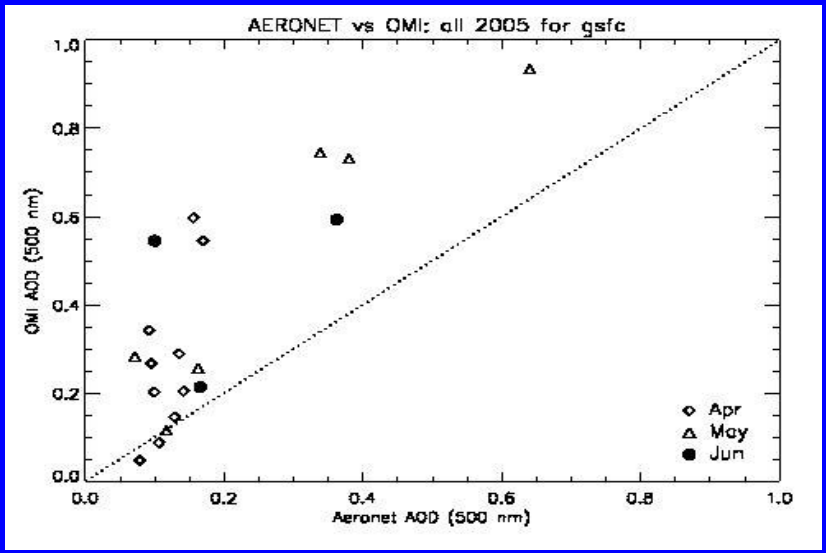
500 nm

-Reasonable agreement at minimum AOD values shows good calibration, GOOD NEWS
-Similar level of agreement at 500 nm shows realistic aerosol models, GOOD NEWS
-Severe sub-pixel cloud contamination, NOT SO GOOD NEWS but expected.

Validation Issues (3): What is the best way to compare satellite-ground based AOD measurements?

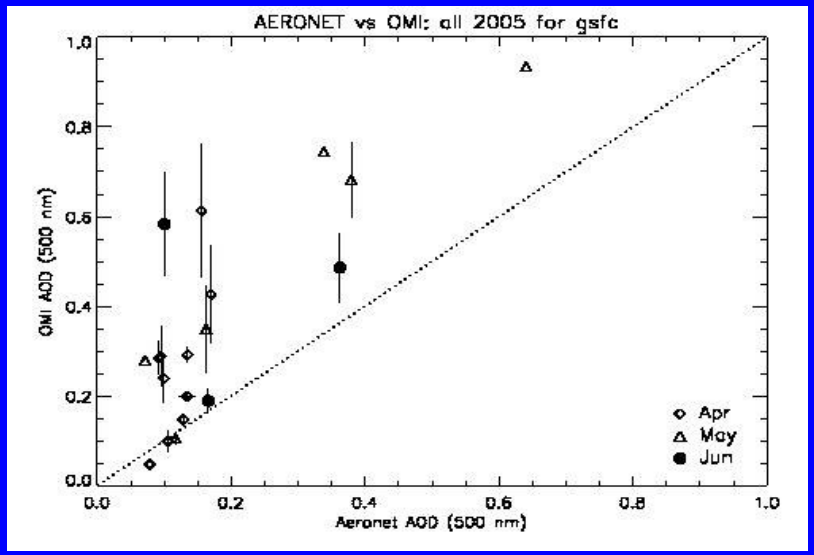


All points

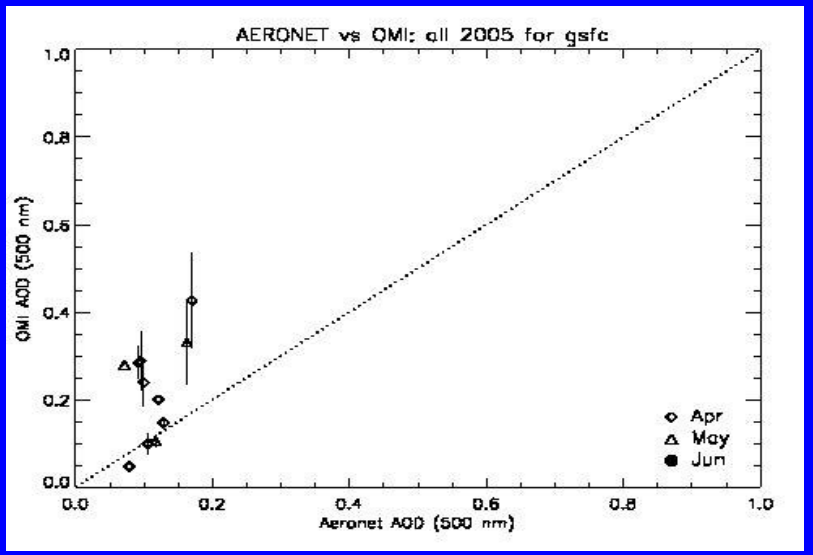


closest pixel

GSFC

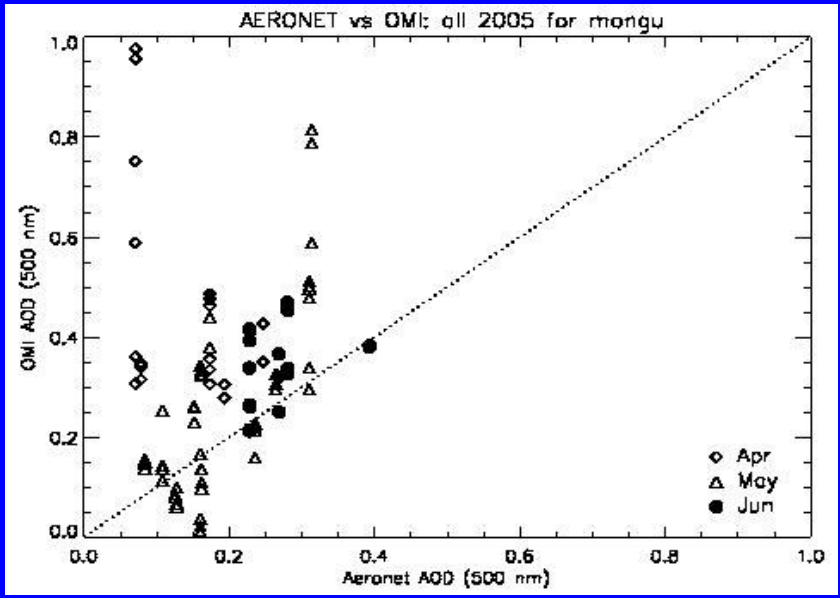


Average

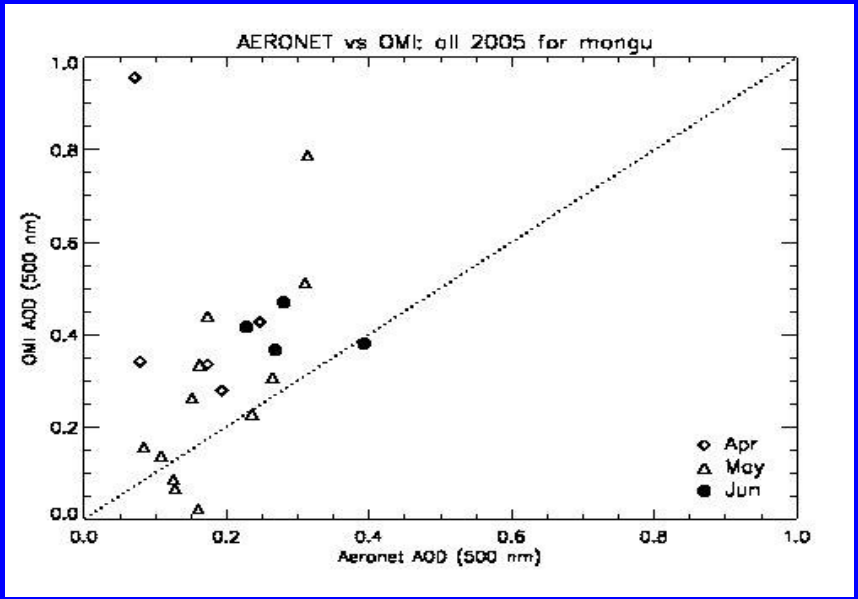


Average and reduced reflectivity

Validation issues (5): Comparison at Mongu

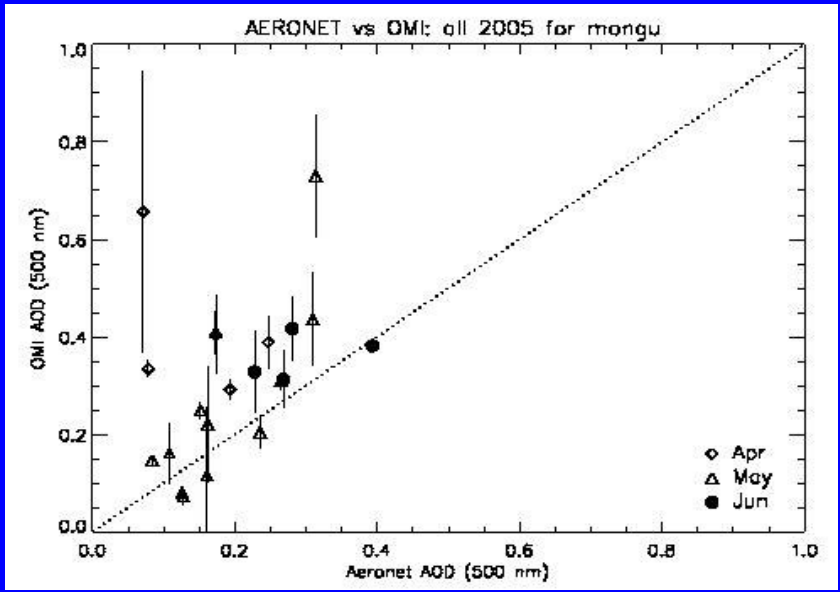


All points

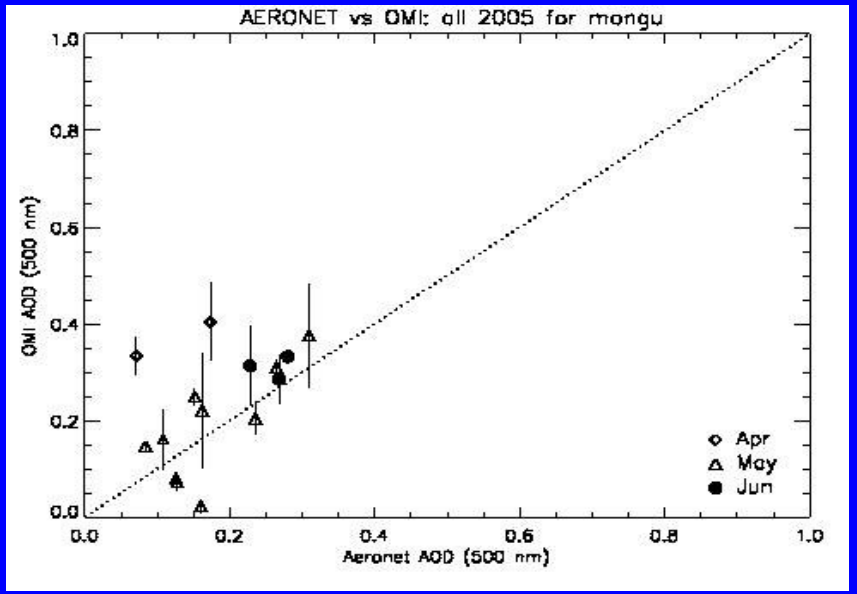


closest pixel

Mongu, Africa



Average



Average and reduced reflectivity

Conclusions and additional comments

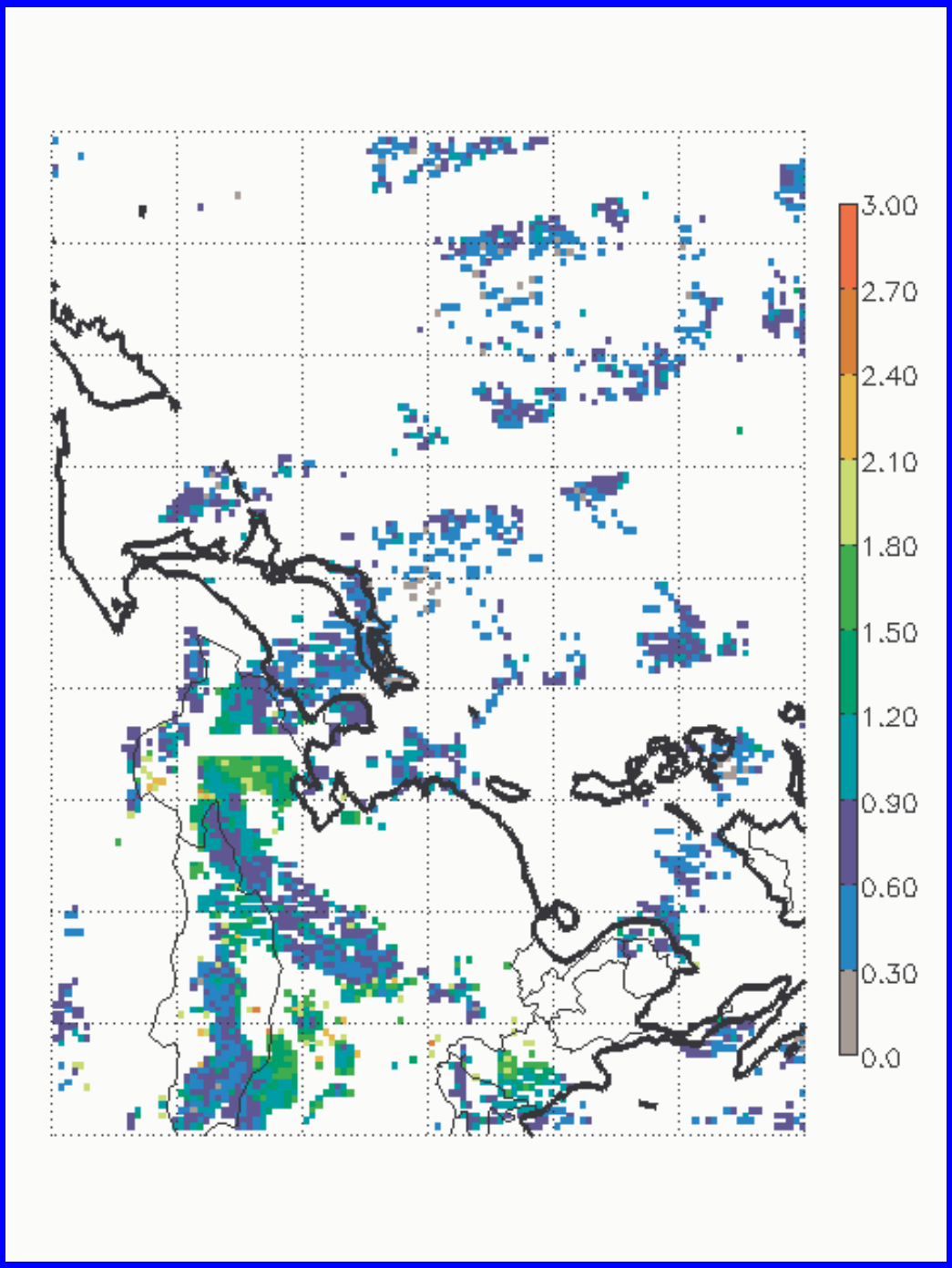
Preliminary validation analysis of the aerosol optical depth product shows
- Current calibration of OMI aerosol channels seems adequate
- The large OMI footprint hampers the application of traditional surface-satellite comparisons.

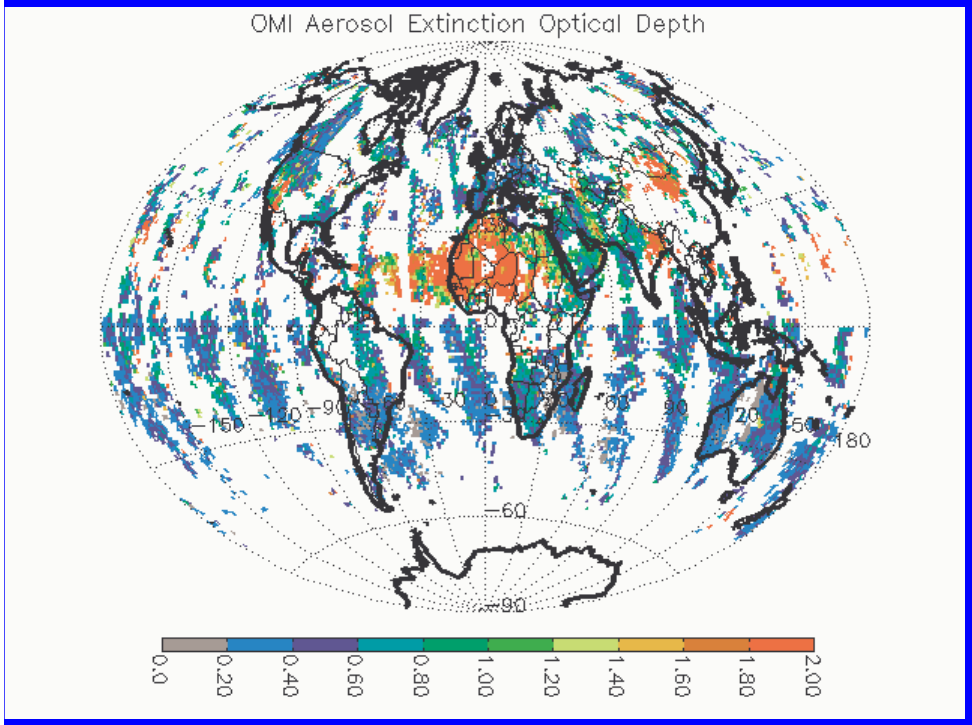
Ground based measurements of near UV aerosol absorption for OMI validation are not available. Ongoing efforts using brewer spectrometer and shadow-band spectro-photometer observations are encouraging.

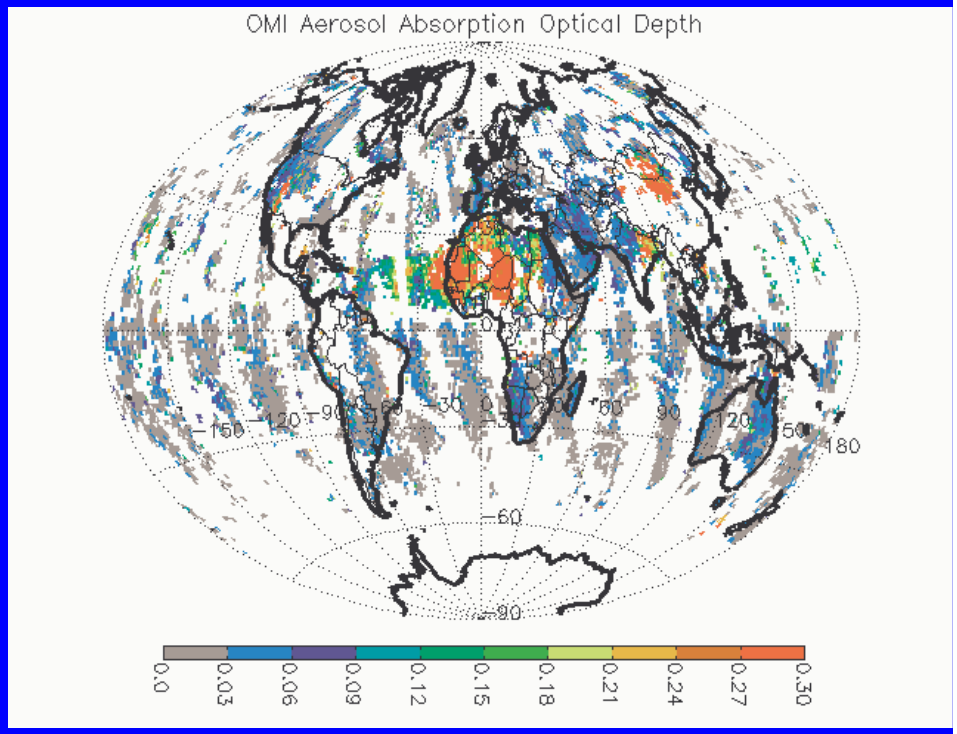
Observations of the vertical distribution of aerosols and clouds are needed to improve the interpretation of the Aerosol Index in the presence of clouds.

Chemical Transport Models (CTM's) calculations are a very useful tool for the evaluation of OMI aerosol products.

Validation efforts of the entire OMI record will continue making use of currently available observations.


3.00
2.70
2.40
2.10
1.80
1.50
1.20
0.90
0.60
0.30
0.0


OMI Aerosol Extinction Optical Depth
0.0
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00


OMI Aerosol Absorption Optical Depth
0.0
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30